

**Apparatus for and Method of Analysing Electronic  
Representations of Business Processes**

**FIELD OF THE INVENTION**

5 The present invention relates to apparatus for and methods of analysing electronic representations of business processes, and to corresponding computer apparatus operating computer programs for operating such methods.

10 **BACKGROUND ART**

In most business processes, such as manufacturing operations, business to business transactions, quality control reviews etc the ability to hold individuals accountable for process steps or transactions is  
15 important. Hence, adequate accountability assurances must be provided in business processes, especially given the malleable nature of digital electronic records. Currently, business flow processes in electronic form are hard-coded according to specific business needs in  
20 applications such as LOTUS NOTES (trade mark). In these applications process steps are normally described in free text terms input by a system administrator, process manager or the like. The absence of a ready mechanism for tracing accountability and verifying business process  
25 history increases the legal risks facing participants of business processes. This is particularly the case for financial business transactions.

It is an aim of preferred embodiments of the present  
30 invention to obviate or overcome a disadvantage of the prior art, whether referred to herein or otherwise.

**SUMMARY OF THE INVENTION**

According to a first aspect of the present invention an apparatus for analysing an electronic representation of a business process comprises a rules database including at least one process rule for at least one process step. A process analyser determines whether a process step complies with the at least one process rule of the rules database and derives a result based on the determination of whether the business process step complies with the at least one process rule.

Suitably, at least one process step is associated with at least one predetermined process rule. Suitably, the rules database comprises data of a process step that will satisfy a predetermined process rule. A given process step can satisfy a given process rule if the process step has associated with it another process step, which may be a sub-step, that satisfies the requirement of the process rule.

Suitably, the rules database comprises a plurality of process rules and the process analyser is configured to determine whether a process step complies with all applicable process rules. Not all process rules are necessarily applicable to a given process. Suitably, the rules database comprises a plurality of process rules for a plurality of process steps. The plurality of process rules need not be of the same number as the plurality of process steps.

Suitably, the apparatus further comprises a reporter for reporting the result of the process analyser. The result

can be generated as a digital file and, optionally, printed.

Suitably, the apparatus further comprises a process  
5 modifier for modifying a process step of the electronic  
representation of the business process to comply with at  
least one process rule of the rules database when the  
process analyser determines that a rule is not being  
followed. Suitably, the rules database comprises a  
10 process modification database including a predetermined  
process modification for compliance with a given process  
rule. The modification can be a change, an addition, a  
deletion, or a combination of these.

15 Suitably, the rules database includes a process  
accountability rule. Suitably, the rules database  
specifies that a given process step shall include a  
digital signature. Suitably, the rules database specifies  
that a given process step shall include a time stamp.  
20 These are methods of ensuring process accountability.

Suitably, the rules database includes a process non-  
repudiation rule. Suitably, the rules database specifies  
that a given process step including a digital signature  
25 shall include a verification of the digital signature.  
This is one method of ensuring process non-repudiation.

Thus, there is provided apparatus for modifying an  
electronic representation of a business process using the  
30 apparatus referred to above.

According to a second aspect of the present invention a  
method of analysing an electronic representation of a

business process comprises the steps of accessing a rules database including at least one process rule for at least one process step and determining whether a process step complies with at least one process rule of the rules  
5 database. A result based on the determination of whether the at least one process step complies with the at least one process rule is denied.

Suitably, at least one process step is associated with at  
10 least one predetermined process rule. Suitably, the rules database comprises data of a process step that will satisfies a predetermined process rule.

Suitably, the rules database comprises a plurality of  
15 process rules and the method comprises the step of determining whether the at least one business process step complies with all applicable process rules. A result based on the determination is denied. Suitably, the rules database comprises a plurality of process rules for a  
20 plurality of process steps.

Suitably, the method comprises the further step of reporting the result of the process analyser. The result can be generated as a digital file and, optionally,  
25 printed.

Suitably, the method further comprises the step of modifying a process step of the electronic representation of the business process to comply with the rules database.  
30 Suitably, the rules database comprises a predetermined process modification for compliance with a given rule. The modification can be a change, an addition, a deletion, or a combination of these.

Suitably, the rules database includes a process accountability rule. Suitably, the rules database specifies that a given process step shall include a digital signature. This is one method of ensuring process accountability. Another is that the rules database can specify that a given process step shall include a time stamp operation.

10 Suitably, the rules database includes a process non-repudiation rule. Suitably, the rules database specifies that a transaction type including a digital signature shall include a verification of the digital signature. This is one method of ensuring process non-repudiation.

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According to a third aspect of the present invention a computer apparatus is arranged for carrying out the method of the second aspect of the present invention.

20 A fourth aspect of the invention relates to a storage device storing a program for causing a computer to perform the method of the second aspect of the present invention.

A rule in the rules database can apply to more than one business process type. A given business process type can have none, one or a plurality of rules applicable to it. Not all business process types will have applicable rules.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

30 The present invention will now be described, by way of example only, with reference to the drawings that follow; in which:

Figure 1 is a schematic illustration of a business process and an apparatus according to the present invention.

Figure 2 is a functional flow diagram of the operation of the apparatus of an embodiment of the present invention.

Figure 3 is a schematic illustration of the business process of Figure 1 after modification by the present invention.

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#### DETAILED DESCRIPTION OF THE DRAWINGS

Referring to the accompanying drawings, business process apparatus 2 for analysing electronic representations of business processes comprises a business process rules database 4, business process analyser 6, a reporter 8 and a business process modifier 10. Typically the business process apparatus 2 is a digital computer (of which apparatus 2 is a schematic representation) operating under the control of a computer program as described in connection with Fig. 2.

A business process can be represented in electronic format by a computer software application, such as LOTUS NOTES (trade mark) and is illustrated schematically by reference numeral 12 in Figure 1. In the business process shown in Figure 1, there are three process steps  $T_1$ ,  $T_2$  and  $T_3$ . As will be appreciated by those skilled in the art, most business processes involve many more steps, but Fig. 1 can be explained with reference to just a few such steps, which can form sub-steps of a larger business process. In the present example, step  $T_1$  is a cheque being issued, typically in response to an invoice; step  $T_2$  is a cheque being approved and step  $T_3$  is the cheque being dispatched

to the payee. Step T<sub>3</sub> has attached to it the requirement that the cheque approval of step T<sub>2</sub> must be digitally signed.

- 5 A task scheduler 14 monitors and governs the operation of the business process 12.

The rules database 4 includes rules for accountability and non-repudiation within a business process. Examples of  
10 business process rules in rules database 4 are:

Rule 1 - cheque approvals must be digitally signed by the signer.

Rule 2 - digital signatures must be verified by a  
15 trusted third party.

These rules relate to accountability and non-repudiation in a business process. The process of Fig. 1 is especially useful for performing rules relating to  
20 accountability and non-repudiation.

Referring to Figure 2 of the drawings that follow, the application of the rules in rules database 4 is described using the business process 12 referred to in connection  
25 with Fig. 1.

In order for the process analyser 6 to compare the business process steps to the requirements of rules database 4, a business process needs to be set up  
30 according to certain guidelines. Normally, in the prior art, the process steps are input in free text form and therefore are unsuitable for reliable computerised analysis. Accordingly, there are provided predetermined

business processes to which corresponding rules are applied. Thus, a business process application in which a business process is modelled is provided with a core set of predetermined business processes a user can select, typically via a drop down menu. The predetermined business processes available have associated with them business process rule in rules database 4. Not all business processes have corresponding process rules and some business processes are likely to have several process rules associated with them.

In an alternative mechanism, business processes are generated in a free text or other format and the user then associates either no process rule, a process rule or several process rules with the business processor. In generating a digital representation of a business process, a user is given the option for each process step of associating none, one or more business process rules with that process. If a business process is added in this way, the process also needs to be specified whether, as a process step, it satisfies the requirements of a process rule.

Thus in step 18 of Figure 2 predetermined process rules from rules database 4 are associated with process steps of business process 12. As a minimum, one process step has one process rule associated with it, but generally many process steps in a business process have process rules applied to them.

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In the present example, process T, has no process rule associated with it, business step T<sub>2</sub> has a requirement for a digital signature (Rule 1) as a process rule associated



with it, and business step  $T_3$  is entered by a user and a process rule requiring third party verification of a digital signature is selected (Rule 2) from rules database 4.

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Also in process rules database 4 are the following business processes:

- $T_4$  - Apply digital signature
- 10  $T_5$  - Verify digital signature with third party.

Step  $T_4$  is indicated as satisfying Rule 1 and step  $T_5$  is indicated as satisfying Rule 2. It will be appreciated that some process steps require several other process  
15 steps to be associated with them (sub-steps, in effect) to satisfy a process rule.

In step 20 the first process step  $T_1$  of the business process 12 is analysed by process analyser 6. In step 22  
20 process analyser 6 determines whether the process step  $T_1$  complies with the business process rules of rules database 4. Process analyser 6 checks the business process step in the relevant process step with the rules relating to that previous step in rules database 4 to determine whether the  
25 relevant rule requirements are met. This can be a simple look-up table, a relational database etc.

In this example, the step of issuing a cheque does not have a relevant rule requirement in rules database 4 so  
30 all rule conditions are met and the process proceeds in step 24 to the next process step  $T_2$ , which is analysed in step 20. In step 22 analyser 6 determines whether process  $T_2$  complies with the relevant rules in rules database 4.

The step of approving a cheque is a process step type to which a rule in rules database 4 applies; in this case the rule is the approval must be digitally signed. If the  
5 business process step  $T_2$  complies with the relevant rule, the process proceeds to step 24 and moves to analyse the next process step  $T_3$ . To comply with the relevant rule, process step  $T_4$  needs to be present in relation to process step  $T_3$ . However, in the business process 12 of Figure 1  
10 the step  $T_2$  of approving a cheque does not have a requirement of applying a digital signature attached to it so the method proceeds to step 26, during which a process modifier is issued. In the case of the analysis of business process 12 reporter 8 issues the process modifier  
15 as a report or message. Alternatively or in addition the business process 12 is modified by business process modifier 10 in step 28 to insert the process step  $T_4$  requirement that the step  $T_2$  be digitally signed. To do this the business process analyser 2 instructs task  
20 scheduler 14 to insert in the business process 12 the new process step  $T_4$ , which is a predetermined process step to be inserted if Rule 1 above is not met. Thus there is a predetermined modification (requiring a digital signature) for compliance with a given rule (Rule 1).

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In either case, the method proceeds via step 24 to the third business process step  $T_3$  during which the cheque is sent to a payee. A prerequisite to step 13 is that a digital signature must be attached to the cheque approved  
30 from step  $T_2$ . However, if at step 22 analyzer 6 determines in relation to step  $T_3$  that the step of checking for a digital signature does not include the process step  $T_5$ , operations proceed to step 26 during

which analyzer 6 issues a process modifier. The analyzer 6 performs process modification step 28. Step T<sub>5</sub> involves verifying the digital signature as required by Rule 2 above. An additional step is issued as a task modifier in  
5 step 26 and optionally used to modify the business process in step 28 by the addition of step T<sub>5</sub> (as described above) to step T<sub>3</sub>.

A modified business process 12A is set out in Figure 3 of  
10 the drawings. Fig. 3 includes additional process steps T<sub>4</sub> and T<sub>5</sub>.

Any process step can include sub-steps therein.

15 Thus, using embodiments of the present invention, electronic representations of business processes are analysed against predetermined rules. If processes to meet the rule requirements are missing, reports are generated and/or the process can be modified automatically  
20 to comply with the relevant rule or rules.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and  
25 which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification  
30 (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination,

except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including  
5 any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series  
10 of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features  
15 disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

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